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Saltbush in farming systems

Increasing the productivity and profitability of South Australian sheep enterprises from grazing saltbush plantations

Newsletter – Edition 3

September 2011

This project is supported by the South Australian Sheep Industry Fund

Newsletter 3 - Saltbush in farming systems

With funding provided by the South Australian Sheep Industry Fund, Productive Nutrition are assessing the value of saltbush to livestock productivity; evaluating the cost efficiency of saltbush plantations and determining the most cost effective supplementary feeding strategies for both ewe and lamb performance.

This edition of the newsletter provides a summary of project progress to date across the three South Australian sites and includes the Coomandook, Mt Russell trial report; with results of ewe hogget performance grazing saltbush and spear grass interrow with either barley or oat supplementation.

Site 1: Carrieton

Ewe productivity grazing saltbush and native pasture with either oat or lupin supplementation is being measured at Glenroy Estate, Carrieton in 2011. Ewe performance throughout the year has been assessed, and marking percentages and lamb weaning weights recorded. Saltbush productivity has been measured to assess dry matter production and nutritive value throughout winter and into spring.

An additional trial is being conducted at Carrieton this year measuring Merino lamb performance and growth rates grazing either saltbush or native pasture whilst being supplemented with lupins. Results of both ewe and lamb Carrieton trials will be presented in the next edition of the project newsletter in January 2012.

Site 2: Coomandook

The final trial at Coomandook for 2011 was completed at the Freak's Mt Russell property in collaboration with SARDI in July 2011. Results from this trial are presented in the attached report. No further trials are planned for Coomandook until autumn 2012.

Site 3: Point Pass

Saltbush dry matter production and nutritive value assessments were completed in April and September 2011, and a further assessment is planned for November 2011. The results of these assessments will be presented in the next edition of the project newsletter.

What's next?

The January 2012 edition of the project newsletter will include trial results and information on:

- Ewe productivity grazing saltbush from the Carrieton site
- Weaner lamb performance at Carrieton
- Saltbush dry matter productivity across the three project sites
- The cost efficiency of saltbush plantations and the cost of dry matter per hectare

Coomandook, Mt Russell trial report 2011

Background

Atriplex nummularia (Oldman saltbush) has proved to be a useful tool in the stabilisation of sand hills and remediation of saline land in the South Australian and Victorian Mallee; however its nutritional and economic value to livestock enterprises remains a questionable issue which this project seeks to answer.

Saltbush is not preferentially grazed by sheep or cattle mainly due to the high concentrations of sodium and potassium contained within the leaves; however saltbush can provide a valuable source of rumen degradable protein to ruminants when alternative pastures have dried off. Although the energy value of saltbush leaves appears to be relatively high from nutritive analyses, such a high salt diet significantly increases energy demand.

For many years now in the absence of published on-farm research, the accepted practice for supplementation of animals grazing saltbush plantations has been barley and barley straw. As saltbush leaves tend to be low in fibre (NDF) advisors have recommended supplementation with barley straw and due to increased energy demand, barley has become the cereal grain of choice.

Animal performance grazing saltbush plantations whether it be maintenance of body condition in dry sheep or growth rates of lambs, has always been suboptimal bringing into question the value of establishing plantations as a feed resource. The aim of this project is to determine the most cost-effective supplement for livestock grazing saltbush plantations and to determine the cost-effectiveness of establishment for livestock production.

This trial outlined below is one component of this investigation over three years.

Mt Russell, Coomandook Merino hogget growth rate trial

This trial was the second in a series of planned trials at the Coomandook property of Tim Freak and family within their saltbush plantation. The live weight gain and body condition score of 12 month old Merino ewe hoggets grazing saltbush with spear grass inter-row was determined. The hoggets were split into four trial groups with one replicate per treatment, supplemented with either oats or barley.

The aim of the trial was to determine animal response to cereal grain supplementation in two forms – high and low starch concentration – while grazing saltbush and dry pasture over 51 days.

Methodology

Trial timeline	
Initial plant measurements and nutritive value (NV) testing	05/05/2011
Start introduction period (weigh and BCS)	13/05/2011
Start trial period (weigh, BCS, plant measurements)	26/05/2011
Mid weigh (weigh, BCS, plant measurements)	15/06/2011
Ration adjusted	22/06/2011
Trial end (weigh, BCS, plant measurements)	28/06/2011

Dry matter disappearance of saltbush was estimated by SARDI collaborators using the Adelaide method (http://www.sardi.sa.gov.au/__data/assets/pdf_file/0005/113279/Supplementing_-pregnant_ewes_on_saltbush.pdf). Interrow feed availability was measured by cutting 7 quadrats in 3 rows per plot, 4 times over the trial period. Feed availability was estimated one week prior to the trial commencing.

Liveweight gain and body condition score (BCS) was measured following an initial weigh at the commencement of the trial and at regular intervals over 44 days. The hoggets were allocated to trial groups based on an even weight distribution at the initial weigh and each group was replicated. Group size varied according to saltbush and interrow feed availability at 16 to 22 hoggets per hectare plot as follows:

- Plot 1 – 16
- Plot 2 – 16
- Plot 3 – 19
- Plot 4 - 22

The nutritive value of the supplementary cereal grains, saltbush and interrow feed per plot was analysed by the SGS laboratory in Toowoomba via either NIR or wet chemistry as required; the saltbush was analysed on only one occasion at the commencement of the trial.

Following the introductory period, the trial groups were supplemented with either barley or oats to meet an equivalent dietary metabolisable energy (ME) concentration of 13.89 MJ ME/head/ day (NRC, 2007) for the first 36 days of the trial. This level of ME was intended to meet daily dietary requirements of a ewe hogget at 50 kg LW. The ration was adjusted on day 37 (June 22nd, 2011) to increase the ME provided to 15.54 MJ ME/head/ day in line with a decline in availability of interrow pasture to avoid weight loss. This adjustment was in agreement with animal ethics approval granted to SARDI.

The hoggets had not been previously supplemented with grain therefore grain was introduced over a two week period to minimise the risk of acidosis from barley.

Ration formulation

Rations were formulated as outlined in Table 1 based on the assumption that there was sufficient feed on offer (FOO) and that intake of both saltbush and interrow feed would be the same across plots. Assumptions were based on saltbush intake estimations from the Booderoo saltbush grazing trial in March 2011 where interrow feed was estimated at 21% of daily DM intake and saltbush at 0.92% of liveweight. Those estimations were based on measurements of disappearance.

Rations were formulated to an equivalent ME as energy is one of the most important limiting factors to liveweight gain when grazing saltbush; however formulating the ration of each plot to ME meant that some rations failed to meet daily protein requirements.

Figure 1 Mt Russell interrow dry matter present on 22 June 2011

Table 1 Initial and adjusted ration formulations per plot

	ME (MJ ME/ day)	***Crude Protein %***	***NDF %***
Initial rations (17/05/2011)			
Plot 1 Barley	13.89	10.5	43
Plot 2 Oats	13.89	11.0	46
Plot 3 Oats	13.89	11.6	47
Plot 4 Barley	13.89	10.4	44
Adjusted rations (22/06/2011)			
Plot 1 Barley	15.54	11.8	43
Plot 2 Oats	15.54	12.1	45
Plot 3 Oats	15.54	12.9	46
Plot 4 Barley	15.54	11.6	43

Grain supplementation

The hoggets were supplemented with grain at a level to complement the nutritive value of the pasture diet to ensure energy requirements were met (Table 2). The levels of grain feeding were increased in the final week of the trial to prevent weight loss as interrow pasture availability reached critical levels.

Table 2 Grain supplementation (g/d) for hoggets in each plot

	Grain supplementation (grams per hd/day)			
	Oats		***Barley***	
Weeks	*1-5*	*6*	*1-5*	*6*
Plot 1			618	720
Plot 2	520	660		
Plot 3	580	700		
Plot 4			620	730

Results

Feed quality

The nutritive value of saltbush and inter-row feed was tested to assess the contribution of ME, crude protein (CP) and fibre (NDF) to the ration (Table 3). The nutritive value of spear grass was low with CP varying across the plots from 5.9 to 8.3% and variation in ME 6.4 to 7.4 MJ ME/ kg DM; senesced spear grass was a major component of the available dry matter in the plots (Figure 1). The ME of the saltbush was 10.6 MJ ME/ kg DM and CP was 6.5%.

No mineral analyses were available from SARDI for saltbush (OMSB) or interrow pasture at the Mt Russell site.

Table 3 Metabolisable energy, crude protein and neutral detergent fibre concentrations of the dietary components

Feed	Metabolisable energy	Crude protein	Neutral detergent fibre
Supplement	*MJ ME/kg DM*	*gms/kg DM*	*gms/kg DM*
Barley (Plot 1 & 4)	13.3	96.0	159.0
Oats (Plot 2 & 3)	13.4	95.0	279.0
Molasses	12.6	70.0	
Roughage			
OMSB	10.6	65	330
Plot 1 - Silvergrass pasture	6.4	61	753
Plot 2- Silvergrass pasture	7.4	76	666
Plot 3- Silver grass pasture	6.6	83	711
Plot 4 - Silver grass pasture	6.4	59	758

Daily pasture growth rate and feed availability

Table 4 highlights the availability of pasture in the interrows per plot compared with saltbush at the start of the trial period.

Pasture growth rate varied during May and June from 7 to 17 kgs dry matter per hectare (ha) per day (Figure 2) however at a stocking rate of between 16 and 22 hoggets per ha, feed demand of between 24 to 36 kg DM per day exceeded that of daily pasture growth (Figure 2).

Table 4 Feed on offer per plot and total feed on offer at the commencement of the trial

	Feed-on-offer kg DM/ha)		
	Inter-row	***Saltbush***	***Total***
Plot 1	*1656*	*441*	*2097*
Plot 2	*1883*	*427*	*2310*
Plot 3	*1998*	*411*	*2409*
Plot 4	*2078*	*372*	*2450*

Feed availability in the interrows increased from May 5th in Plots 1, 2 and 3 when measured on May 26th whereas there was a steady decline in available feed in Plot 4 over the same period (Figure 3).

As the trial progressed the interrow feed disappeared at a faster rate than the saltbush averaging 19.6kg DM per day and 4.5kg DM per day respectively.

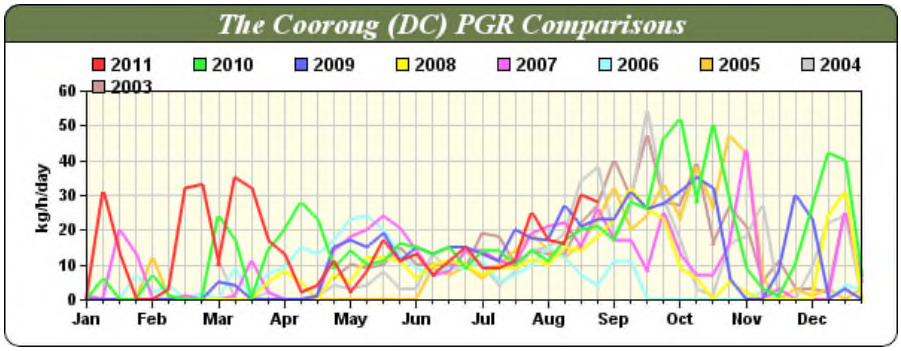

Figure 2 Pasture growth rate in the Coorong District Council area (-) during the hogget trial (Source: Pastures from Space)

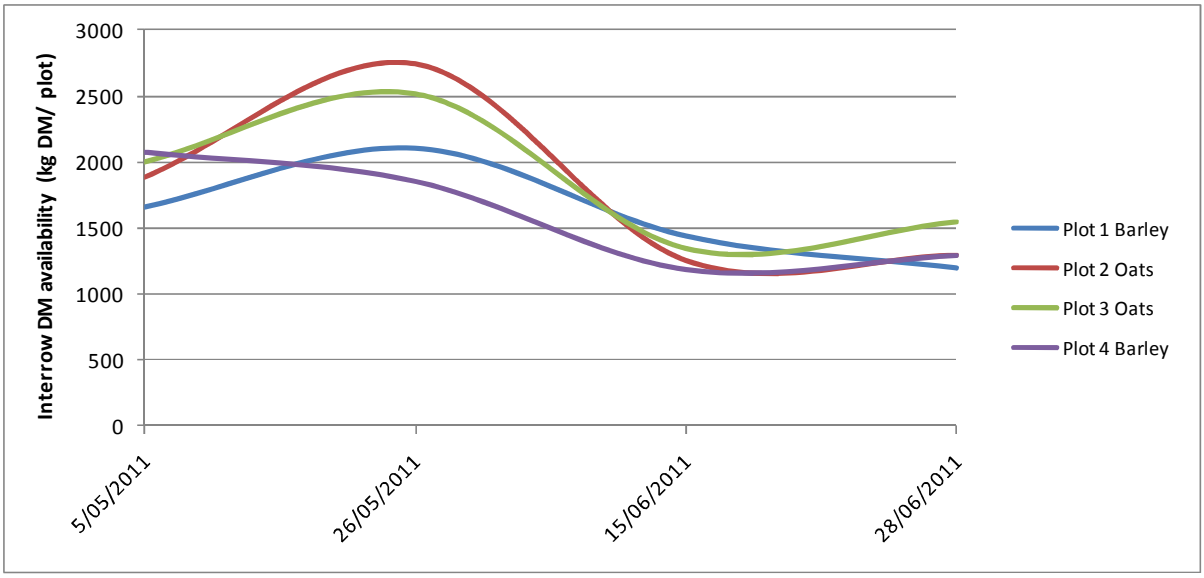

Figure 3 Estimated pasture availability (kg DM/ha) in the interrow from May 5th to June 28th, 2011

The availability of saltbush over the same period remained stable in Plots 1 and 2 but declined in Plots 3 and 4 as depicted in Figure 4.

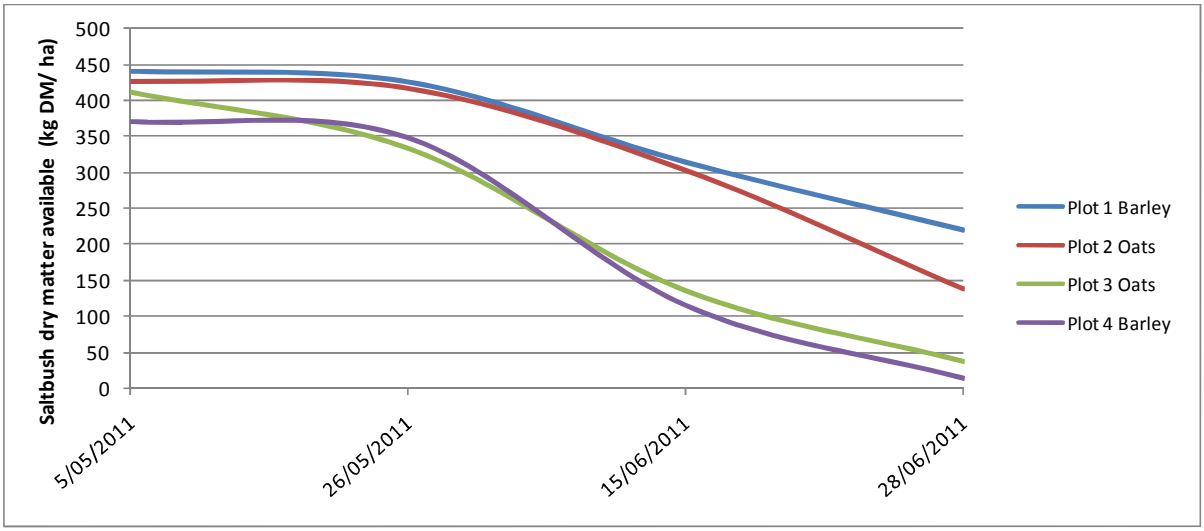

Figure 4 Estimated availability of saltbush (kg DM/ha) from May 5th to June 28th, 2011

Dry matter intake

Saltbush intake, as estimated from disappearance, increased over the trial period in Plots 1 and 2; disappearance increased in Plots 3 and 4 until the 15th May after which time intake declined in line with a decline in feed availability. The hoggets in Plot 2 had the highest intake of saltbush at 0.75kg DM/ head/ day. The daily saltbush intake of hoggets grazing in Plots 3 and 4 declined to 0.38 kg DM/ head/ day in line with a reduction in feed availability.

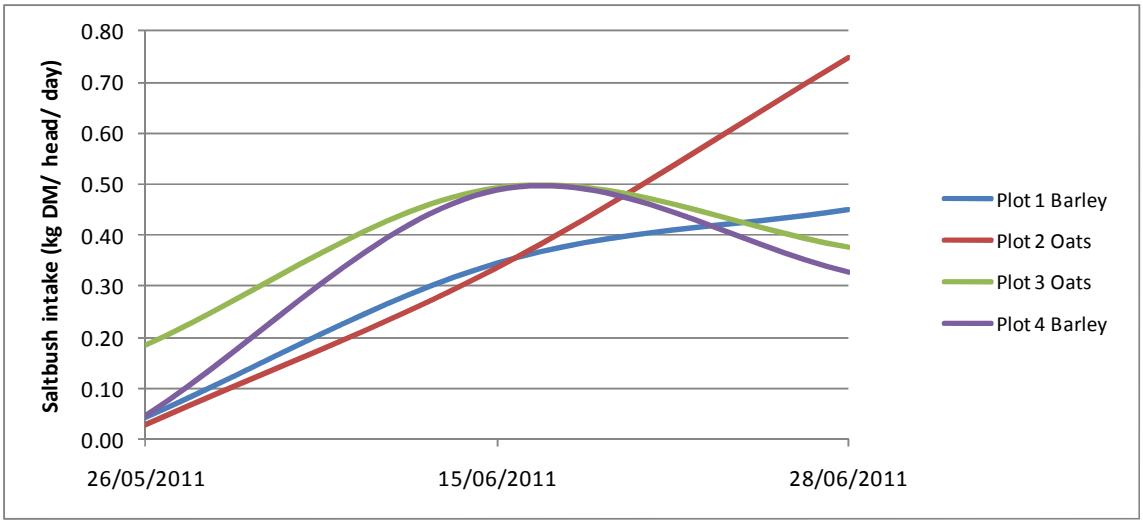

Figure 5 Estimated saltbush intake (kg DM/day) based on measurements of disappearance

Hogget weight and body condition

The average growth rate of the ewe hoggets over the two week introductory period was 120g/ head/ day, after which time growth rates slowed (Table 5).

Table 5 Average hogget growth rates (kg/day) at Mt Russell 2011 trial

	13/05/2011 to 26/05/2011	26/05/2011 to 15/06/2011	15/06/2011 to 28/06/2011	Average
Plot 1 Barley	0.128	-0.060	0.058	0.026
Plot 2 Oats	0.063	0.047	0.058	0.054
Plot 3 Oats	0.206	0.034	0.032	0.082
Plot 4 Barley	0.084	0.011	-0.054	0.013

All lambs gained weight over the trial period with the highest weight gains being recorded in Plots 2 and 3 where hoggets were supplemented with oats. Although rates of daily gain were slow all the hoggets supplemented with oats gained weight (Figure 6) whereas those in Plot 1 lost weight in the middle and in Plot 4 in the last week of the trial period.

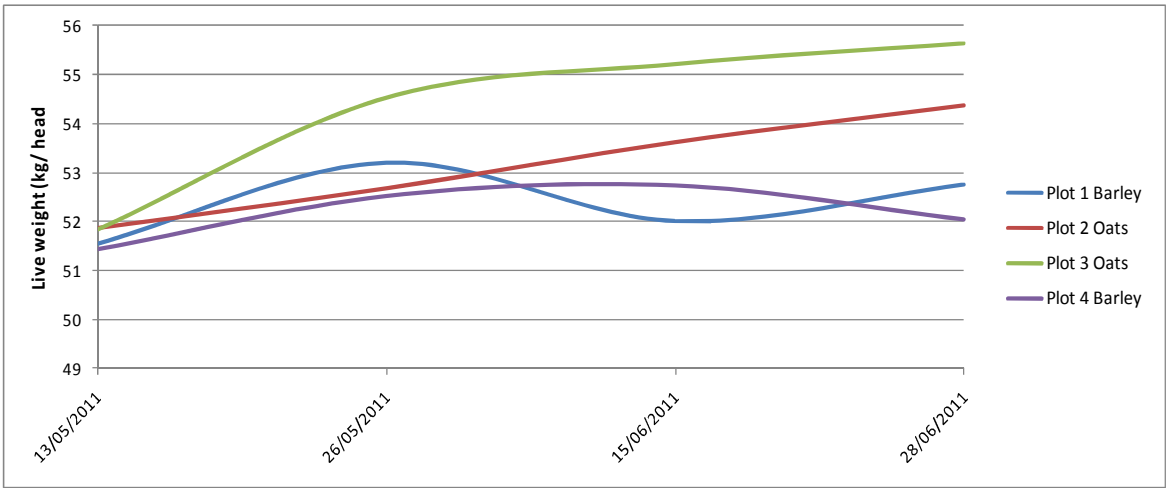

Figure 6 Average live weights of hoggets in each trial plot

Body condition score (BCS) of hoggets decreased (Figure 7) from 3.5 to 2.5 during the first 2 weeks of the trial period after which time condition was maintained at an average of 2.5 across all plots.

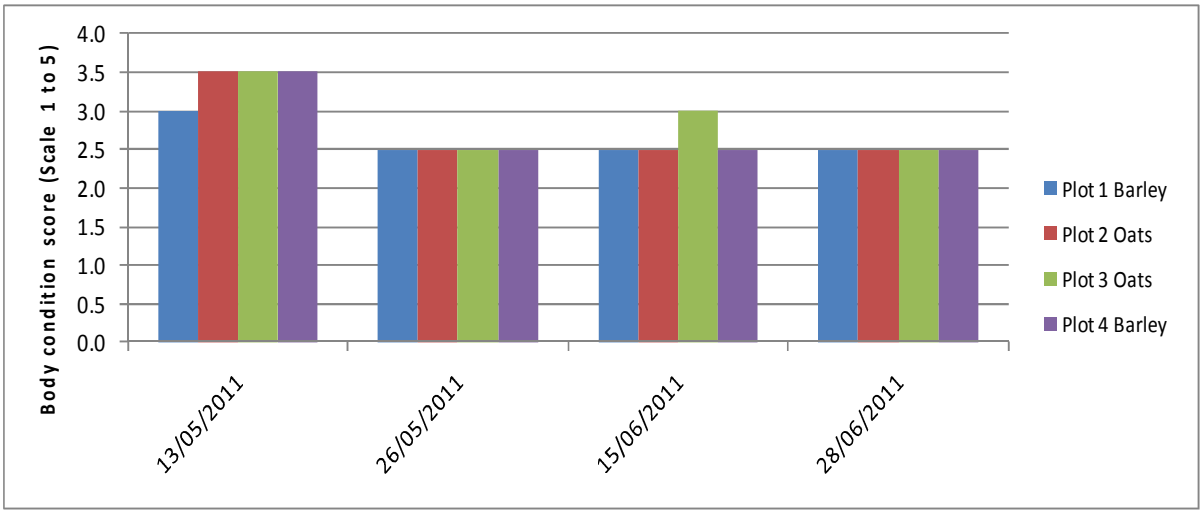

Figure 7 Median body condition score of hoggets in each trial plot throughout the trial

Discussion

The saltbush plantation at Mt Russell is situated on a deep, non-saline sandy rise which is grazed once a year generally in autumn, such that the sheep used in the trial had not had prior exposure to saltbush.

73 Merino hoggets were allocated to the four plots based on an even weight distribution and according to dry matter availability and allowing for a residual dry matter of 1 tonne to avoid erosion and ensure weight gain. Despite an above average season in 2010/2011 interrow pasture was not abundant nor was the availability of saltbush per plant. Relatively high proportions of grain supplementation were required to meet the requirements of 12 month old replacement ewe lambs as neither the interrow pasture nor the saltbush were particularly high in nutritive value.

The feed demand of the sheep per plot exceeded daily pasture growth rate from 3 weeks after the commencement of the trial such that there was a steady decline in feed on offer from 3 to 6 weeks. Pasture availability appeared to increase in all but Plot 1 at the final measurement however this could have been attributed to an increase in grain feeding and hence a reduction in pasture intake, at that time.

Saltbush intake was estimated from measurements of disappearance in the absence of a more accurate reflection of intake. The highest rate of saltbush disappearance over the six weeks was recorded in Plot 2 where hoggets were supplemented with oats at 520g/head per day for 5 weeks.

In the initial 3 week period animals in Plots 3 and 4 consumed the most saltbush however intake rapidly declined over the last 3 weeks with a reduction in availability. Consumption in Plot 1 remained constant over the 6 week period. There did not appear to be an association between grain supplement and saltbush intake whereas intake appeared to be more closely related to adaptation and availability. As availability declines saltbush leaves become progressively more difficult to access through the sharp stalks of the saltbush therefore a reduction in intake at that time was in line with expectations.

Body condition score of all sheep fell one score after the first three weeks of the trial and remained stable at 2.5 from that point on; this is typical of sheep grazing saltbush where retention of fat cover is a challenge. This has been attributed to an increase in metabolic rate in response to a high salt diet.

The liveweight gain of the hoggets in Plot 1 aligned with the interrow pasture on offer and availability of saltbush however there was no clear relationship between feed on offer and weight gain in the remaining 3 trial groups. It is thought that the high levels of grain supplementation may have masked growth rate responses to feed on offer.

Hoggets supplemented with oats in Plots 2 and 3 gained weight throughout the trial period however those supplemented with barley in Plots 1 and 4 lost weight in the middle of the trial period and during the last week respectively.

Barley is more likely to cause acidosis or a fall in rumen pH due to rapid fermentation of starch in the rumen however the majority of energy available from oats is provided by the breakdown of fats and not starch and as such the risk of acidosis is almost negligible. Many of the newer varieties of oats have similar ME values to barley, wheat and triticale and are therefore a safer feed.

Unfortunately it was not possible to attribute the higher growth rate response to oat supplementation as the hoggets being supplemented with barley were on a lower protein diet than those on the oats. The spear grass in Plots 1 and 4 was lower in protein than in Plots 2 & 3 which may have contributed to the reduction in growth rate of hoggets within those plots. Animals in Plot 3 had the highest rate of weight gain throughout the trial and had a diet that was higher in protein than the other three groups.

It is anticipated that this trial will be repeated in autumn 2012 with the 2011 drop ewe hoggets.

Conclusion

- Hoggets grazing saltbush had higher rates of liveweight gain when supplemented with oats compared with barley
- This trial supports industry experience that sheep grazing saltbush are more likely to maintain a body condition score of 2.5 rather than 3.5 regardless of the type and amount of grain supplementation
- Acceptable and satisfactory levels of liveweight gain can be achieved by Merino hoggets in autumn grazing saltbush supplemented with oats in preference to barley